



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/589,898

08/18/2006

Yukihiro Nakasaka

129122

2477

25944 7590 02/18/2009
OLIFF & BERRIDGE, PLC
P.O. BOX 320850
ALEXANDRIA, VA 22320-4850

EXAMINER

VILAKAZI, SIZO BINDA

ART UNIT

PAPER NUMBER

3747

MAIL DATE

DELIVERY MODE

02/18/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/589,898	Applicant(s) NAKASAKA, YUKIHIRO	
	Examiner SIZO B. VILAKAZI	Art Unit 3747	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 December 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 and 16-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 and 16-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

The Amendments and Applicant arguments submitted on 12/10/2008 have been received and its contents have been carefully considered.

Claim 15 is cancelled.

Claims 1-14 and 16-19 are presented for examination.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-3, 5-7, 9-11, 13, and 16-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shomura (US Patent No. 6,170,465 B1) in view of Ishikawa et al. (US Patent No. 6,975,934 B2), Mashiki (US Patent No. 6,176,220 B1), **and Sugiyama et al. (US Patent 6,792,901 B2).**

3. In Re claims 1-3, Shomura discloses

a. An injection amount control means for changing a fuel injection amount from an injection amount for stoichiometric operation to either an increased

Art Unit: 3747

amount or a decreased amount (Fig. 1, item 23, Column 7, Lines 36-43, and Lines 54-62)

b. A computation means for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount is changed by the injection amount control means (Fig. 1, item 39, Column 7, Lines 54-62 and Column 8, Lines 10-14)

c. that the various detected values detected by the various sensors, or the values stored in the control unit could be output to the vehicle's tachometer or other such device (Column 14, Lines 38-67)

d. that the rotation speed change is stored in the control unit (Column 10, Lines 17-22), therefore it is a value capable of being output

4. With regards to the "injection amount control means for changing a fuel injection amount from an injection amount for stoichiometric operation to either an increased amount or a decreased amount" within claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112 6th paragraph. The "injection amount control means for changing a fuel injection amount from an injection amount for stoichiometric operation to either an increased amount or a decreased amount" is explained on Page 29, Lines 3-14 and Fig. 1, item 18 in the specification. Shomura teaches a means for changing the fuel injection amount (Column 7, Lines 36-43, and Lines 54-62). The method taught by Shomura is considered to be equivalent because it performs the same function in substantially the same way and produces substantially the same result as the corresponding element in the applicant's specification.

Art Unit: 3747

5. With regards to the "computation means for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount is changed by the injection amount control means" within claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112 6th paragraph. The "computation means for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount is changed by the injection amount control means" is explained on Page 29, Lines 15-21 in the specification. Shomura teaches a means for determining the rotation speed change that occurs when the fuel injection amount is changed (Column 7, Lines 54-62 and Column 8, Lines 10-14). The method taught by Shomura is considered to be equivalent because it performs the same function in substantially the same way and produces substantially the same result as the corresponding element in the applicant's specification.

6. With regards to the "output means for outputting the torque or rotation speed change amount determined by the computation means as an index value that indicates the degree of intake air amount variation among the cylinders" within claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112 6th paragraph. The "output means for outputting the torque or rotation speed change amount determined by the computation means as an index value that indicates the degree of intake air amount variation among the cylinders" is explained on Page 30, Lines 9-26 in the specification.

Art Unit: 3747

7. Shomura does not disclose output means for outputting the torque or rotation speed change amount determined by the computation means as an index value that indicates the degree of intake air amount variation among the cylinders

8. However, Ishikawa et al. acknowledge that the variation in air intake amount can be detected or corrected based on the engine torque or rotational speed variation resulting from a change in fuel injection amount (Column 1, Line 64 through Column 2 Line 40)

9. Shomura/Ishikawa et al. do not disclose the comparison and judgment means as set forth in the claim.

10. However, Mashiki discloses

a. comparison means for comparing a predetermined reference value with the amount of a change that occurs when the injection amount control means changes the fuel injection amount from the injection amount for stoichiometric operation (Column 10, Lines 58-63; and Column 14, Lines 5-26);

b. and judgment means, which, when comparing the change to the reference value, judges that a permissible level is exceeded by the air intake amount variations among the cylinders (Column 10, Line 65 through Column 11, Line 17).

11. The examiner notes that Mashiki compares the predetermined reference value ($dlnv - C1$) to the amount of change that occurred (dln), and judges that a permissible torque variation is exceeded as evidenced by the subsequent change in fuel injection amount (Column 11, Lines 15-17). As has already been discussed, Ishikawa discloses

Art Unit: 3747

that it is common knowledge in the art that excess torque variation is linked to air intake variation, thus in judging that excess torque variation has been exceeded, Mashiki judges that a permissible level of intake air amount variation is exceeded.

12. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Shomura/Ishikawa with the system disclosed by Mashiki in order to make adjustments to the fuel injection amount only when an excessive amount of air amount variation among cylinders occurs.

13. **As to the newly added limitation of the intake air amount variation detector comprising: *Conversion means for converting the intake air amount variations among the cylinders to intake valve operating angle variations among the cylinders and/or intake valve lift amount variations among the cylinders.***

14. **Sugiyama et al. disclose a control system with the claimed conversion means (Column 1, Lines 44-55)**

15. **Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclosed by Shomura/Ishikawa/Mashiki with the operating angle conversion means disclosed by Sugiyama et al in order to accurately adjust the intake air amounts in each cylinder of the engine.**

16. In Re claims 5-7, Shomura discloses

- a. An injection amount control means for changing a fuel injection amount for a particular one of the cylinders from an injection amount for stoichiometric

Art Unit: 3747

operation to either an increased amount or a decreased amount (Column 7, Lines 36-43 and Lines 54-62, Column 10, Lines 61-67)

b. A computation means for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the injection amount control means (Column 7, Lines 54-62 and Column 8, Lines 10-14)

c. that the various detected values detected by the various sensors, or the values stored in the control unit could be output to the vehicle's tachometer or other such device (Column 14, Lines 38-67)

d. that the rotation speed change is stored in the control unit (Column 10, Lines 17-22), therefore it is a value capable of being output

17. With regards to the "An injection amount control means for changing a fuel injection amount for a particular one of the cylinders from an injection amount for stoichiometric operation to either an increased amount or a decreased amount" within claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112 6th paragraph. The "injection amount control means for changing a fuel injection amount from an injection amount for stoichiometric operation to either an increased amount or a decreased amount" is explained on Page 35, Lines 3-18 and Fig. 1, item 18 in the specification. Shomura teaches a means for changing the fuel injection amount (Column 7, Lines 36-43, and Lines 54-62). The method taught by Shomura is considered to be equivalent because it performs the same function in

Art Unit: 3747

substantially the same way and produces substantially the same result as the corresponding element in the applicant's specification.

18. With regards to the "computation means for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the injection amount control means" within claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112 6th paragraph. The "computation means for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the injection amount control means" is explained on Page 35, Lines 19-22 in the specification. Shomura teaches a means for determining the rotation speed change that occurs when the fuel injection amount is changed (Column 7, Lines 54-62 and Column 8, Lines 10-14). The method taught by Shomura is considered to be equivalent because it performs the same function in substantially the same way and produces substantially the same result as the corresponding element in the applicant's specification.

19. With regards to the "output means for outputting the torque or rotation speed change amount determined by the computation means as an index value that indicates the degree of intake air amount variation in the particular cylinder" within claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112 6th paragraph. The "output means for outputting the torque or rotation speed change amount determined by the computation means as an index value that indicates the

Art Unit: 3747

degree of intake air amount variation in the particular cylinder” is explained on Page 36, Lines 1-21 in the specification.

20. Shomura does not disclose output means for outputting the torque or rotation speed change amount determined by the computation means as an index value that indicates the degree of intake air amount variation in the particular cylinder.

21. However, Ishikawa et al. acknowledge that the variation in air intake amount can be detected or corrected based on the engine torque or rotational speed variation resulting from a change in fuel injection amount (Column 1, Line 64 through Column 2 Line 40).

22. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified system disclosed by Shomura with the information disclosed by Ishikawa et al. to arrive at an output means for outputting torque or rotation speed change amount determined by the computation means as an index value that indicates the degree of intake air amount variation in the particular cylinder, with the purpose in mind of adjusting the intake air in accordance with the torque variation (Ishikawa, Col. 2, line 36-41).

23. Furthermore, Shomura/Ishikawa et al. do not disclose the comparison and judgment means as set forth in the claim.

24. However, Mashiki discloses

- a. comparison means for comparing a predetermined reference value with the amount of a change that occurs when the injection amount control means

Art Unit: 3747

changes the fuel injection amount from the injection amount for stoichiometric operation (Column 10, Lines 58-63; and Column 14, Lines 5-26));

b. and judgment means, which, when comparing the change to the reference value, judges that a permissible level is exceeded by the air intake amount variations among the cylinders (Column 10, Line 65 through Column 11, Line 17).

25. The examiner notes that Mashiki compares the predetermined reference value ($d_{lnv} - C1$) to the amount of change that occurred (d_{ln}), and judges that a permissible torque variation is exceeded as evidenced by the subsequent change in fuel injection amount (Column 11, Lines 15-17). As has already been discussed, Ishikawa discloses that it is common knowledge in the art that excess torque variation is linked to air intake variation, thus in judging that excess torque variation has been exceeded, Mashiki judges that a permissible level of intake air amount variation is exceeded.

26. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Shomura/Ishikawa with the system disclosed by Mashiki in order to make adjustments to the fuel injection amount only when an excessive amount of air amount variation among cylinders occurs.

27. **As to the newly added limitation of the intake air amount variation detector comprising: *Conversion means for converting the intake air amount variations among the cylinders to intake valve operating angle variations among the cylinders and/or intake valve lift amount variations among the cylinders.***

Art Unit: 3747

28. Sugiyama et al. disclose a control system with the claimed conversion means (Column 1, Lines 44-55)

29. Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclosed by Shomura/Ishikawa/Mashiki with the operating angle conversion means disclosed by Sugiyama et al in order to accurately adjust the intake air amounts in each cylinder of the engine.

28. In Re claims 9-11, Shomura discloses

a. An injection amount control means for changing a fuel injection amount from an injection amount for stoichiometric operation to either an increased amount or a decreased amount (Column 7, Lines 36-43 and Lines 54-62, Column 10, Lines 61-67)

b. A computation means for determining on an individual cylinder basis the amount of a torque or rotation speed change that occurs when the fuel injection amount is changed by the injection amount control means (Column 7, Lines 54-62 and Column 8, Lines 10-14)

c. that the various detected values detected by the various sensors, or the values stored in the control unit could be output to the vehicle's tachometer or other such device (Column 14, Lines 38-67)

d. that the rotation speed change is stored in the control unit (Column 10, Lines 17-22), therefore it is a value capable of being output

Art Unit: 3747

29. With regards to the "injection amount control means for changing a fuel injection amount for a particular one of the cylinders from an injection amount for stoichiometric operation to either an increased amount or a decreased amount" within claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112 6th paragraph. The "injection amount control means for changing a fuel injection amount from an injection amount for stoichiometric operation to either an increased amount or a decreased amount" is explained on Page 41, Lines 5-7 and Fig. 1, item 18 in the specification. Shomura teaches a means for changing the fuel injection amount (Column 7, Lines 36-43, and Lines 54-62). The method taught by Shomura is considered to be equivalent because it performs the same function in substantially the same way and produces substantially the same result as the corresponding element in the applicant's specification.

30. With regards to the "computation means for determining on an individual cylinder basis the amount of a torque or rotation speed change that occurs when the fuel injection amount is changed by the injection amount control means" within claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112 6th paragraph. The "computation means for determining on an individual cylinder basis the amount of a torque or rotation speed change that occurs when the fuel injection amount is changed by the injection amount control means" is explained on Page 41, Lines 11-14 in the specification. Shomura teaches a means for determining the rotation speed change that occurs when the fuel injection amount is changed (Column 7, Lines 54-62 and Column 8, Lines 10-14). The method taught by Shomura is considered to be

Art Unit: 3747

equivalent because it performs the same function in substantially the same way and produces substantially the same result as the corresponding element in the applicant's specification.

31. With regards to the "output means for outputting the torque or rotation speed change amount determined by the computation means as an index value that indicates the degree of intake air amount variation in an individual cylinder" within claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112 6th paragraph. The "output means for outputting the torque or rotation speed change amount determined by the computation means as an index value that indicates the degree of intake air amount variation in an individual cylinder" is explained on Page 41, Lines 25 through Page 42, Line 22 in the specification.

32. Shomura does not disclose output means for outputting the torque or rotation speed change amount determined by the computation means as an index value that indicates the degree of intake air amount variation in an individual cylinder.

33. However, Ishikawa et al. acknowledge that the variation in air intake amount can be detected or corrected based on the engine torque or rotational speed variation resulting from a change in fuel injection amount (Column 1, Line 64 through Column 2 Line 24).

34. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified system disclosed by Shomura with the information disclosed by Ishikawa et al. to arrive at an output means for outputting torque or rotation speed change amount determined by the computation means as an

Art Unit: 3747

index value that indicates the degree of intake air amount variation in an individual cylinder, with the purpose in mind of adjusting the intake air in accordance with the torque variation (Ishikawa, Col. 2, line 36-41).

35. Furthermore, Shomura/Ishikawa et al. do not disclose the comparison and judgment means as set forth in the claim.

36. However, Mashiki discloses

a. comparison means for comparing a predetermined reference value with the amount of a change that occurs when the injection amount control means changes the fuel injection amount from the injection amount for stoichiometric operation (Column 10, Lines 58-63; and Column 14, Lines 5-26));

b. and judgment means, which, when comparing the change to the reference value, judges that a permissible level is exceeded by the air intake amount variations among the cylinders (Column 10, Line 65 through Column 11, Line 17).

37. The examiner notes that Mashiki compares the predetermined reference value ($dI_{nv} - C1$) to the amount of change that occurred (dI_n), and judges that a permissible torque variation is exceeded as evidenced by the subsequent change in fuel injection amount (Column 11, Lines 15-17). As has already been discussed, Ishikawa discloses that it is common knowledge in the art that excess torque variation is linked to air intake variation, thus in judging that excess torque variation has been exceeded, Mashiki judges that a permissible level of intake air amount variation is exceeded.

Art Unit: 3747

38. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Shomura/Ishikawa with the system disclosed by Mashiki in order to make adjustments to the fuel injection amount only when an excessive amount of air amount variation among cylinders occurs.

39. **As to the newly added limitation of the intake air amount variation detector comprising: *Conversion means for converting the intake air amount variations among the cylinders to intake valve operating angle variations among the cylinders and/or intake valve lift amount variations among the cylinders.***

40. **Sugiyama et al. disclose a control system with the claimed conversion means (Column 1, Lines 44-55)**

41. **Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclosed by Shomura/Ishikawa/Mashiki with the operating angle conversion means disclosed by Sugiyama et al in order to accurately adjust the intake air amounts in each cylinder of the engine.**

42. In Re claim 13, Shomura discloses:

- a. first injection amount control means for changing the fuel injection amount for a particular one of the cylinders from an injection amount for stoichiometric operation to an increased amount (Fig. 1, item 23, Column 7, Lines 36-43, and Lines 54-62)
- b. output means for outputting the torque or rotation speed change amount determined by the first computation means and the torque or rotation speed

Art Unit: 3747

change amount determined by the second computation means as index values that indicate the degree of intake air amount variation in the particular cylinder (see claim 1 rejection above)

43. Shomura does not disclose:

- a. first computation means for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the first injection amount control means
- b. second injection amount control means, which, when the torque or rotation speed change amount determined by the first computation means is not greater than a predetermined reference value, decreases the fuel injection amount for the particular cylinder from the injection amount for stoichiometric operation
- c. second computation means for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the second injection amount control means (

44. However, Mashiki discloses:

- a. first computation means for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the first injection amount control means (Column 9, Lines 54-58)
- b. second injection amount control means, which, when the torque or rotation speed change amount determined by the first computation means is not greater than a predetermined reference value, decreases the fuel injection amount for

Art Unit: 3747

the particular cylinder from the injection amount for stoichiometric operation
(Column 10, Line 58 through Column 11, Line 17)

c. second computation means for determining the amount of a torque or
rotation speed change that occurs when the fuel injection amount for the
particular cylinder is changed by the second injection amount control means
(Column 9, Lines 22-29)

45. With regards to the "first computation means for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the first injection amount control means" within claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112 6th paragraph. The "first computation means for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the first injection amount control means" is explained on Page 55, Line 26 through Page 56, Line 1 in the specification. Mashiki teaches a means for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the first injection amount control means (Column 9, Lines 54-58). The method taught by Mashiki is considered to be equivalent because it performs the same function in substantially the same way and produces substantially the same result as the corresponding element in the applicant's specification.

46. With regards to the "second injection amount control means, which, when the torque or rotation speed change amount determined by the first computation means is

Art Unit: 3747

not greater than a predetermined reference value, decreases the fuel injection amount for the particular cylinder from the injection amount for stoichiometric operation” within claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112 6th paragraph. The “second injection amount control means, which, when the torque or rotation speed change amount determined by the first computation means is not greater than a predetermined reference value, decreases the fuel injection amount for the particular cylinder from the injection amount for stoichiometric operation” is explained on Page 57, Lines 11-16 in the specification. Mashiki teaches a means, which, when the torque or rotation speed change amount determined by the first computation means is not greater than a predetermined reference value, decreases the fuel injection amount for the particular cylinder from the injection amount for stoichiometric operation (Column 10, Line 58 through Column 11, Line 17). The method taught by Mashiki is considered to be equivalent because it performs the same function in substantially the same way and produces substantially the same result as the corresponding element in the applicant’s specification.

47. With regards to the “second computation means for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the second injection amount control means” within claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112 6th paragraph. The “second computation means for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the second injection amount control means” is

Art Unit: 3747

explained on Page 57, Lines 16-18 in the specification. Mashiki teaches a means for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the second injection amount control means (Column 9, Lines 22-29). The method taught by Mashiki is considered to be equivalent because it performs the same function in substantially the same way and produces substantially the same result as the corresponding element in the applicant's specification.

48. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified system disclosed by Shomura with the invention disclosed by Mashiki to arrive at the current invention.

49. Furthermore, Shomura/Ishikawa et al. do not disclose the comparison and judgment means as set forth in the claim.

50. However, Mashiki discloses

- a. comparison means for comparing a predetermined reference value with the amount of a change that occurs when the injection amount control means changes the fuel injection amount from the injection amount for stoichiometric operation (Column 10, Lines 58-63);
- b. and judgment means, which, when comparing the change to the reference value, judges that a permissible level is exceeded by the air intake amount variations among the cylinders (Column 10, Line 65 through Column 11, Line 17).

Art Unit: 3747

51. The examiner notes that Mashiki compares the predetermined reference value ($d_{lnv} - C1$) to the amount of change that occurred (d_{ln}), and judges that a permissible torque variation is exceeded as evidenced by the subsequent change in fuel injection amount (Column 11, Lines 15-17). As has already been discussed, Ishikawa discloses that it is common knowledge in the art that excess torque variation is linked to air intake variation, thus in judging that excess torque variation has been exceeded, Mashiki judges that a permissible level of intake air amount variation is exceeded.

52. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Shomura/Ishikawa with the system disclosed by Mashiki in order to make adjustments to the fuel injection amount only when an excessive amount of air amount variation among cylinders occurs.

53. **As to the newly added limitation of the intake air amount variation detector comprising: *Conversion means for converting the intake air amount variations among the cylinders to intake valve operating angle variations among the cylinders and/or intake valve lift amount variations among the cylinders.***

54. **Sugiyama et al. disclose a control system with the claimed conversion means (Column 1, Lines 44-55)**

55. **Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclosed by Shomura/Ishikawa/Mashiki with the operating angle conversion means disclosed by Sugiyama et al in order to accurately adjust the intake air amounts in each cylinder of the engine.**

Art Unit: 3747

56. In Re claims 16-18, Shomura discloses
- a. An injection amount control unit for changing a fuel injection amount from an injection amount for stoichiometric operation to either an increased amount or a decreased amount in a particular cylinder, or on an individual cylinder basis (Column 5, Lines 24-26, and Column 7, Lines 17-30)
 - b. A computation unit for determining on an individual cylinder basis the amount of a torque or rotation speed change that occurs when the fuel injection amount is changed by the injection amount control means in a particular cylinder, or on an individual cylinder basis (Column 8, Lines 10-14)
 - c. An output unit for outputting the torque or rotation speed change amount determined by the computation unit as an index value that indicates the degree of intake air amount variations among the cylinders (Column 14, Lines 38-67)
57. Shomura does not disclose the comparison and judgment units as set forth in the claim.
58. However, Mashiki discloses
- a. a comparison unit for comparing a predetermined reference value with the amount of a change that occurs when the injection amount control means changes the fuel injection amount from the injection amount for stoichiometric operation (Column 10, Lines 58-63);
 - b. and a judgment unit, which, when comparing the change to the reference value, judges that a permissible level is exceeded by the air intake amount

Art Unit: 3747

variations among the cylinders (Column 10, Line 65 through Column 11, Line 17).

59. The examiner notes that Mashiki compares the predetermined reference value ($dlnv - C1$) to the amount of change that occurred (dln), and judges that a permissible torque variation is exceeded as evidenced by the subsequent change in fuel injection amount (Column 11, Lines 15-17). As has already been discussed, Ishikawa discloses that it is common knowledge in the art that excess torque variation is linked to air intake variation, thus in judging that excess torque variation has been exceeded, Mashiki judges that a permissible level of intake air amount variation is exceeded.

60. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Shomura/Ishikawa with the system disclosed by Mashiki in order to make adjustments to the fuel injection amount only when an excessive amount of air amount variation among cylinders occurs.

61. **As to the newly added limitation of the intake air amount variation detector comprising: *Conversion means for converting the intake air amount variations among the cylinders to intake valve operating angle variations among the cylinders and/or intake valve lift amount variations among the cylinders.***

62. Sugiyama et al. disclose a control system with the claimed conversion means (Column 1, Lines 44-55)

63. Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclosed by Shomura/Ishikawa/Mashiki with the operating angle conversion means disclosed

Art Unit: 3747

by Sugiyama et al in order to accurately adjust the intake air amounts in each cylinder of the engine.

64. In Re claim 19, Shomura discloses:

- a. first injection amount control unit for changing the fuel injection amount for a particular one of the cylinders from an injection amount for stoichiometric operation to an increased amount (Column 5, Lines 24-26, and Column 7, Lines 17-30)
- b. output unit for outputting the torque or rotation speed change amount determined by the first computation means and the torque or rotation speed change amount determined by the second computation means as index values that indicate the degree of intake air amount variation in the particular cylinder (Column 14, Lines 38-67)

65. Shomura does not disclose:

- a. first computation unit for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the first injection amount control means
- b. second injection amount control unit, which, when the torque or rotation speed change amount determined by the first computation means is not greater than a predetermined reference value, decreases the fuel injection amount for the particular cylinder from the injection amount for stoichiometric operation

Art Unit: 3747

c. second computation unit for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the second injection amount control means (

66. However, Mashiki discloses:

a. first computation unit for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the first injection amount control means (Column 8, Lines 60-65)

b. second injection amount control unit, which, when the torque or rotation speed change amount determined by the first computation means is not greater than a predetermined reference value, decreases the fuel injection amount for the particular cylinder from the injection amount for stoichiometric operation (Column 8, Lines 38-42)

c. second computation unit for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the second injection amount control means (Column 8, Lines 60-65)

d. a comparison unit for comparing a predetermined reference value with the amount of a change that occurs when the injection amount control means changes the fuel injection amount from the injection amount for stoichiometric operation (Column 10, Lines 58-63);

Art Unit: 3747

e. a judgment unit, which, when comparing the change to the reference value, judges that a permissible level is exceeded by the air intake amount variations among the cylinders (Column 10, Line 65 through Column 11, Line 17).

67. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified system disclosed by Shomura with the invention disclosed by Mashiki to arrive at the current invention.

68. **As to the newly added limitation of the intake air amount variation detector comprising: *Conversion means for converting the intake air amount variations among the cylinders to intake valve operating angle variations among the cylinders and/or intake valve lift amount variations among the cylinders.***

69. **Sugiyama et al. disclose a control system with the claimed conversion means (Column 1, Lines 44-55)**

70. **Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclosed by Shomura/Ishikawa/Mashiki with the operating angle conversion means disclosed by Sugiyama et al in order to accurately adjust the intake air amounts in each cylinder of the engine.**

71. Claims 4, 8, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shomura/Ishikawa et al./Mashiki/**Sugiyama et al.** as applied to claims 1, 5, and 9 above, and further in view of Maloney (US Patent 6,481,273 B2).

Art Unit: 3747

72. In re Claims 4, 8, and 12, Shomura/Ishikawa et al./Mashiki/**Sugiyama et al.** disclose the claimed invention except for the process wherein the computation means extracts a change component having the same frequency as a fuel injection amount change frequency etc.

73. However, filtering process is common knowledge in the art, as is evidenced by Maloney, who discloses the claimed response filtering process (Column 1, Line 45 through Column 2, Line 2).

74. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclosed by Shomura/Ishikawa et al./Mashiki/**Sugiyama et al.** with the filtering process disclosed by Maloney in order to get a more accurate assessment of change in torque as a result of a single fuel injection.

75. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shomura/Ishikawa et al./Mashiki//**Sugiyama et al.**/Maloney as applied to claims 1 and 4 above, and further in view of Yomogida (US Patent 6,513,496 B2).

76. In re Claim 14 Shomura/Ishikawa et al./Mashiki//**Sugiyama et al.**/Maloney do not explicitly disclose a periodic change of injection outside of the range of human perception.

77. However, Yomogida discloses a system wherein an injection amount control means periodically changes the fuel injection amount at a frequency outside the range of human perception (see abstract)

Art Unit: 3747

78. Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclosed by Shomura/Ishikawa et al./Mashiki//**Sugiyama et al.**/Maloney with the injection amount control means disclosed by Yomogida in order to provide a system that is less disturbing to the occupants of the vehicle.

Response to Arguments

79. Applicant's arguments with respect to claim 15, as discussed in the interview held on 11/20/2008 have been considered but are moot in view of the new ground(s) of rejection.

80. In response to the addition of the limitations of Claim 15 ("Conversion means for converting the intake air amount variations among the cylinders to intake valve operating angle variations among the cylinders and/or intake valve lift amount variations among the cylinders"), being added to claims 1, 5, 9, 13, 16, 17, 18, and 19, the examiner asserts that Sugiyama et al. disclose the claimed conversion means.

Conclusion

81. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

Art Unit: 3747

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SIZO B. VILAKAZI whose telephone number is (571)270-3926. The examiner can normally be reached on M-F: 10:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen K. Cronin can be reached on (571) 272-4536. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 3747

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/SIZO B VILAKAZI/
Examiner, Art Unit 3747

/Stephen K. Cronin/
Supervisory Patent Examiner, Art Unit 3747